USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005NV83B

Title: Aggregating Hydraulic Property Measurements to Large Scales and Potential Applications on Water Budget Studies in Arid and Semi-Arid Environment

Project Type: Research

Focus Categories: Hydrology, Water Supply, Methods

Keywords: Soil hydraulic properties, Upscaling, Averaging schemes, Heterogeneous soil formation, van Genuchten model

Start Date: 03/01/2005

End Date: 02/28/2006

Federal Funds: $24,192

Non-Federal Matching Funds: $48,436

Congressional District: Nevada 01

Principal Investigator:
Jianting Julian Zhu
Desert Research Institute

Abstract

This research project tries to answer an outstanding question: What will be the effective/average hydraulic properties for the entire pixel (such as a grid cell in large scale hydro-climate models or a footprint of a remote sensor) for a typical soil textural combination in a real field condition, if the soil hydraulic properties can be measured or estimated at point scales? Using the actual field hydraulic property measurements by researchers at the Desert Research Institute from across various locations of arid and semi-arid regions, we try to develop conceptual guidelines of how to scale up these hydraulic property data to large scale that can be used to simulate a variety of large scale hydrologic processes.

The developed guidelines are focused on soil heterogeneity and infiltration/ evaporation scenarios. The approach can be extended to evapotranspiration and other large scale hydrologic processes that are very important in Nevada's water resources and budget studies. The expected outcomes from this project will be a suite of optimal averaging schemes for the hydraulic parameters for a variety of hydrologic processes and conditions

with an emphasis on the evaporation and infiltration scenarios, typical for arid and semi-arid regions in western United States.

The novelty of the proposed research is to treat more realistic transient flow and the possible need to have two separate optimal averaging schemes for early and late stage behavior and the adoption of the p-norm that clearly indicates the deviation from the usual arithmetic mean. The proposed approach embraces both natural complexity and practical utility based on some simplifications that mean to catch main features of the considered scenarios.